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(54) **METHOD AND APPARATUS OF EXPOSING LIGHT SENSITIVE MATERIAL BY MEANS OF A COPYING MACHINE HAVING A VERTICALLY MOVABLE LASER UNIT**

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(73) Proprietor: **Misomex AB**
**Box 6034**
**S-126 06 Hägersten (SE)**

(72) Inventor: **DILLOW, Brian St. Pierre Misomex Aktiebolag**
**Box 6034**
**S-126 06 Hägersten (SE)**

(74) Representative: **Avellan-Hultman, Olle**
**Avellan-Hultman Patentbyra AB**
**P.O. Box 5366**
**S-102 49 Stockholm (SE)**

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EP 0 586 497 B1

## Description

The present invention relates to a method and an apparatus for exposing multi-pages original images onto a light sensitive offset plate or an intaglio plate by means of a laser exposure/burning process.

Lately some print makers have started to use laser light beams for exposing light sensitive offset plates or intaglio plates. The advantages of using laser is, among other things, that it is possible:

- to execute the exposure directly from computer stored information concerning text, sketches and half-tone pictures etc. without the need of using negative of positive transparent films, as has so far been usual,
- that the size of the dots which are to create the image can, within wide limits, be determined and controlled, in particular the dot creating a half-tone picture in the print and which corresponds to the screen dot in conventional screen copying processes, and this is possible in that the laser light builds up the screen dot from a large number of pixles, generally between 64 and 256 pixles per screen dot,
- and that therefore the gradation of the grey scale of the laser reproduced image on the printing plate can be varied within wide limits.

Like in conventional copying processes the laser light provides an activation of the illuminated part of the printing plate so that, in the succeeding developing process, said activated printing plate parts become ink carrying if the printing plate is of the positive type, or non-ink carrying respectively if the printing plate is of the negative type.

There are to-day three main methods of laser exposing printing plates, namely exposing a plate lying on a flat bed, the so called flat bed method, exposing a plate mounted inside a cylindrical drum whereby the exposing is made from inside the curved plate, which process is called internal drum method, and exposing of a plate mounted exteriorly on a cylindrical drum, whereby the exposure is made from outside, which process is called external drum method.

Each one of said three methods is disadvantageous in some respects;

- In the flat bed method the entire printing plate is exposed in one single exposure step by means of a sweeping laser light beam. Generally the laser apparatus including the so called "laser gun" is starionary, whereas the printing plate is displacable on an exposure table in relation to the laser unit. During the exposure the laser unit emits an oscillating light beam which hits the plate while said plate is slowly moving passed the laser unit until the entire plate has been exposed. Alternatively it is possible to keep the exposure table still standing and to allow the laser unit to wander over the plate during the exposure. In this type of the flat bed copying machine the distance from the laser gun or the lens system thereof to the side edges of the printing plate is substantially longer than to the central parts of the plate, and this has as an effect that the sharpness and the shape of the laser dot exposed on the printing plate varies depending on where the laser beam hits the plate. For reducing, to some extent, the problem with this variation in dot sharpness and shape the laser gun generally is mounted on a relative high distance above the printing plate, and for equalizing the always existing unavoidable variations in dot sharpness and shape in this type of copying machine the laser gun generally is adjusted so that the sharpness of the laser dot is located slightly to high at the edges of the plate and slightly to low at the central parts of the plate. As a consequence an ideal dot is located somewhere between the centre and the edges of the plate. Depending on the said machine design the laser copying machine is high and clumsy, and the laser burning is relatively uneven when comparing different parts of the printing plate. Another problem is to, as far as possible, eliminate the vibrations which unevitably appear when the copying table and the laser unit move in relation to each other;
- Depending on the large height of the apparatus it is very sensitive to vibrations, and even a very little unexpected movement of the laser dot on the printing plate, for instance caused by a slight shaking of the laser gun, the dot will be unsharp on the printing plate, in particular since the laser gun normally projects between 64 and 256 pixles for creating each separate screen dot when exposing an optimum grey scale;
- For a good result in this method it is necessary that the base for the printing plate, generally the base of the copying machine, is extremely even, since even a very little uneveness in the surface makes the sharpness of the dots vary;
- It may also be very difficult to move the printing plate and the laser gun with an exact speed and a uniform movement in relation to each other, and it often happens that there is a slight difference in speed and uniformity and this makes the laser dots slightly overlap each other or to be loacted too far from each other, and this, in turn, makes stripes appear

in the ready print;

- The necessary large working area for the laser gun makes it necessary to use a heavy laser gun and a large and expensive lens system, and therefore the apparatus will be remarkably expensive;
- In the internal and external drum methods the printing plate is generally more safely secured in relation to the laser gun than in the flat bed method, and therefore a better copying quality is obtained than with the flat bed machines. In the internal and external drum methods, however, there are on the contrary problems in mounting of the printing plate inside and on the outer surface of the drum respectively; in some cases there also are problems in obtaining an even laser exposure all over the width of the plate, especially in the internal drum method; there are also problems in obtaining an exact fixedly mounting of the printing plate on the drum (for accurate plate register); and usually there is a restricted maximum size for the printing plate.

A serious problem in all known copying methods is that the printing plate and the laser unit may move in relation to each other during the copying process. Therefore a special purpose of the invention is to foresee that the laser unit and the printing plate are safely secured in relation to each other before the copying process is started, thereby eliminating any possibility of said parts to move in relation to each other.

The object of the invention further is to suggest a method and an apparatus which solves most of the above mentioned problems and disadvantages in the priorly known methods and apparatus; and to suggest a method and an apparatus which further allows a substantially fully automatized exposure of several successive printing plates of the same or varying size; in which the apparatus is substantially lower and claims for less precision and accuracy in the manufacture than the apparatus for executing the priorly known methods; in which the laser gun is mounted substantially closer to the printing plate to be exposed than in priorly known apparatus; in which the apparatus is substantially less sensitive to shakings and vibrations; and in which the apparatus is slimplier and cheaper than all the above mentioned three priorly known laser copying machine types.

According to the invention said objects are fulfilled in that the laser unit is lowered and is safely locked to the plate laying on the exposure table before the exposing isstarted, whereupon the printing plate is exposed in several stages by means of laser light beams, and whereby the plate accordingly is exposed in several successive stages with only a minor part of the plate at the time, for instance with two or four pages at the time of the usually 16, 32 or 64 pages large printing plate This is made by an automatized handling comprising collecting an un-exposed light sensitive plate, exposing said plate by the action of four different but cooperating movements, namely a) a stepwise displacement of a plate table in a certain direction, the X-direction, b) a stepwise displacement of the laser unit in a Y-direction and c) a lowering and locking of the laser unit against the printing plate, and d) a successive movement of a special part (the laser gun) of the laser unit in the X-direction or the Y-direction during the oscillatory sweep exposure, which movement alternatively can be made in the X-direction or the Y-direction, and finally an expelling of the exposed printing plate from the copying apparatus for subsequent developing and other handling.

The method also makes it possible to make use of two or more small laser units parallelly to each other.

It should be emphasized that the designation "light sensitive plate" or "printing plate" is meant to include not only offset and intaglio printing plates but also any other possible types of light sensitive material like light sensitive films (negative and positive).

Further characteristics of, and advantages with, the invention will be evident from the following detailed specification in which reference will be made to the accompanying drawings, which illustrate an embodiment of an apparatus according to the invention.

In the drawings figure 1 diagrammatically shows a copying plant according to the invention having, for the sake of clearness the protection housings for the plate magazine and the plate expeller partly opened. Figure 2 is an X-ray sketch of the same plant as in figure 1 showing more in detail the plate feeder and the plate expeller. Figure 3 is an exploded view of the laser unit and parts of the machine base, which figure more in detail shows the step copying process in the apparatus according to the invention. Figure 4 is a fragmentary, vertical view through the copying machine seen along line IV-IV of figure 2 and illustrating the situation during the setting of the apparatus to the intended plate part to be copied, and figure 5 correspondingly shows the situation during the copying process.

The basic structure of the copying machine shown in the drawings is of the known type which is manufactured by the Swedish corporation Misomex Aktiebolag and which is marketed under the name "Step And Repeat" machine and which comprises five main parts, namely a plate cassette 1, a plate loading lift 2, a laser unit 3, a discharge

conveyor 4 and a movable exposure table 5.

The plate loading lift 2, the laser unit 3 and the discharge conveyor 4 are formed as a continuous path which is serviced by the movable exposure table 5. At one end the exposure table 5 is arranged to receive an un-exposed light sensitive plate 6, which is collected by the plate loading lift 2, and at the other end the exposure table 5 puts the exposed plate 6 down on the discharge conveyor 4, which feeds the plate directly into a (not shown) developing unit which is directly connected to the copying machine.

The plate cassette 1, which is only diagrammatically indicated in the drawings, is mounted underneath the plate loading lift 2, and it is designed for receiving such a large number of plates or other light sensitive means which correspond to an entire working period, for instance 50-75 plates, so that the machine can operate fully-automatized for an entire (day) working period. As usual the plates in the plate cassette preferably may be formed with punched register bores which fit register pins of the exposure table, so that any and all successively collected plates are placed in a very accurately predetermined position on the exposure table and are exposed by the laser unit over a very exatly determined area of the plate.

Alternatively register bores may be punched in the plate after the plate is placed on the exposure table. In such case the register becomes exact in relation to the exposed portions of the plate.

The plate loading lift 2 comprises a system of tubes having suction cups 7, and it is arranged for being lowered to the plate cassette 1 by means of hydraulic or pneumatic cylinders 8 for seizing the uppermost plate 6 in the casette 1, for being lifted together with the plate and for being lowered thereby depositing the the plate on the exposure table 5. The machine is programmed so that the exposure table 5 is loacted in its end position far from the plate loading lift when a new plate 6 is being picked up.

The movable exposure table 5 on which the plate 6 is laid down is movable along a straight path 8 of the machine base 10, which path can be referred to as the X-direction, between an end position far to the right in the drawings, in which position the plate 6 is laid down on the table, an intermediate position underneath the laser unit 3, in which position the plate 6 is exposed, and an end position far to the left in the drawings, in which position the plate 6 is put down on the discharge conveyor 4 for subsequent transportation to a developping machine.

The laser unit 3 is mounted on a carriage 11 which is movable in a direction, which can be referred to as the Y-direction and which is perpendicular to the above mentioned X-direction of the exposure table 5. The laser carriage rolls on a path 12 which is integral with the machine base 10. The laser carriage 11, in turn, carries the actual laser gun 13 with its lens system movable along a path 14, which may exstend in the X-direction or the Y-direction depending on the desired sweeping direction of the laser light beam. In figures 3-5 the path 14 of the laser gun 13 is shown extending in the X-direction, that is parallelly to the path 12 of the laser carriage 11.

The laser unit is arranged for exposing of only a minor portion of the light sensitive plate at the time, and the laser gun 13 therefore can be of small size and can be mounted relatively close to the exposure table 5 with the plate 6. As mentioned above this involves several advantages, of which it should be emphasized that there is a very little risque of shaking-unsharpness on the plate 6 on the exposure table 5, that the laser gun 13 and the lens system thereof can be made of relatively small size and can be manufactured to low costs, that a good precision and accuracy is obtained for the laser dots on the light sensitive plate, and that there is a relatively little difference in focal distances at different parts of each exposure portion of the plate 6.

As one typical example figure 3 shows a printing plate 6 comprising thirtytwo print pages and in which plate four pages are being exposed at the time. For the sake of clearness the laser gun 13 is shown exploded from the laser carriage 11. The light beam sweeping movement of the laser gun 13 is shown with the phantom lines 15. The parts 16 of the plate 6 marked with the hatched lines have already been exposed whereas the non-exposed portions of the plate are shown blank. Upon exposure of four pages at the time, as in the illustrated case, the laser carriage 11 adjusts itself in two alternative X-positions, one position of which is shown in figure 5, and in which the laser light beam during the exposure sweeps in an oscillating and successively in the X-direction extended movement from the far remote longitudinal edge 17 of the plate 6 and over four pictures or pages. In the illustrated position the laser beam has sweep-exposed two complete and two half pages in the adjusted position.

When the four actual pages have been exposed the laser carriage 11 moves to its second end positon in which the laser beam exposes the four additional pages 18 in this X-row of pair of pages. When also said four pages 18 have been exposed the exposure table 5 with the plate 6 moves a distance towards the discharge end corresponding to two rows of pages and the laser beam starts exposing the last series but one of four pages, etc.

The laser unit is of a known type and is therefore not to be described in detail. It comprises a laser gun having a lens system which is adjusted so that the focus of the laser light beam falls on the light sentive plate. The laser may be of various types. As an example of a suitable laser beam source can be mentioned argon-ion-laser. Of course other types of laser beam sources can be used.

Figures 4 and 5 show the laser unit 3 more in detail. It is obvious that the machine base 10a is directly integral with the laser base 10b, and that the path 12 of the laser base 10b provides a guide for the laser carriage, which is generally referred to with numeral 11. The laser carriage 11 comprises a carriage means 19 which with a grooved bar 20 is slidable on the base path 12, and which over a number of hydraulic cylinders 21 carries the laser carrier 22. The laser carrier 22 also has a path 23 on which a grooved bar 24 of a wagon 25 for the laser gun 13 is movable.

The laser unit has two moving possibilities: firstly the carriage with the laser carrier 22 can be moved on the laser base 10b; and secondly the laser gun 13 as mounted on its wagon 25 can be displaced on the laser carriage 22. In the illustrated case the displacements follow in the same direction, the Y-direction, but it is obvious that the laser gun 13 as well may be moved in a direction (X-direction) which is perpendicular to the direction of movement of the laser carrier 22.

It is important to the invention that the laser carrier 22 with the wagon 25 and the laser gun 13 can be raised and lowered by means of the cylinders 21. The object thereof is that the laser unit can be locked to the plate 6 lying on the exposure table 5. To this end the laser carrier 22 is formed with a downwards extending, box-formed foot 26 which at the bottom thereof may have a sealing antiskid element 27 adapted to get into contact with the plate 6.

This embodiment is good for two reasons:

a) by lowering the carrier foot 26 with its sealing element 27 into contact with the plate 6 it is not possible for the laser unit 3 to move in relation to the plate 6, and the laser light will fall with good sharpness and precision on each separate point of the plate;

b) depending on the box-shape of the foot 26 of the laser carrier 22 said foot effectively restricts exactly the area of the plate 6 which is to be exposed, and the exposing consequently is made only within this specific area.

Figure 4 shows the laser unit 3 in its raised position in which position the exposure table 5 and/or the laser carriage 11 can be moved to a new adjustment position, or a ready exposed plate 6 can be expelled to the discharge conveyor. Figure 5 shows the same apparatus in its fully lowered position in which position the plate 6 is being exposed.

The entire apparatus plant comprising the plate cassette 1, the plate loading lift 2, the laser unit 3 and the discharge conveyor 4 are formed light sealed, so that the plant can be used also in soft daylight. The discharge conveyor thereby is connected to a developing station which can be placed in any type of dark-room. It is indicated in figures 1 and 2 that the laser gun 13, during its movement in relation to the laser carrier 22, is light sealed by means of a Venetian blind 28 or a similar light sealing means.

The described apparatus functions as follows:

In the starting position the exposure table 5 is retracted from the plate loading lift 2, and said lift thereby can be lowered to collect and lift the uppermost light sensitive plate 6 of the plate cassette 1. The laser unit 3 is in its raised position shown in figure 4. The exposure table 5 now is moved to a position under the plate 6 hanging in the plate lift 2, whereupon the plate 6 is lowered and is secured, by means its punch holes, on equivalent locating pins of the exposure table. The plate loading lift 2 is lifted, and the exposure table 5 with the plate 6 secured thereon is moved such a long distance in the X-direction under the laser unit 3 which corresponds to the number of Y-direction (longitudinal) rows of pages to be exposed. Concurrently therewith the laser unit 3 is moved in the Y-direction to a position for exposing the number of X-direction (cross) rows of pages which are to be exposed, e.g. two or four pages out of an 8-, 16- or 32-pages light sensitive plate.

The laser unit 3 now is lowered by the actuation of the hydraulic cylnders 21 so that the bottom of the foot 26 of the laser carrier 22 engages the upper surface of the plate 6.

In the position now taken the actual number of pages are exposed in that the laser gun 13, in a light beam sweeping movement 15, moves in the Y-direction (alternatively in the X-direction) over the four pages on its path 14 of movement.

After the said four pages have been exposed the laser unit 3 is raised from the plate 6 and the laser carriage 11 moves a predetermined distance in the Y-direction to enter a position for exposing the next series of, for instance, four pages.

When now a row consisting of eight pages has been exposed the exposure table 5 moves a distance corresponding to two pages in the X-direction, whereafter the next sequence of exposure of 4 + 4 pages is started. Correspondingly the exposure table 5 and the laser unit 3 step forward until the full series of 8 exposures (8 * 4 = 32 pages) is completed, whereupon the exposure table 5 is moved to a position above the discharge conveyor

4, which receives the plate 6, as known per se, and forwards same to a means for development or any other supplementary handling. At the same time as the ready exposed plate is deposited on the discharge conveyor 4 the plate loading lift 2 collects a new, un-exposed plate 6 from the plate cassette 5 and a new cycle is started.

REFERENCE NUMERALS

| | |
|---|---|
| 1 | plate cassette |
| 2 | plate loading lift |
| 3 | laser unit |
| 4 | discharge conveyor |
| 5 | exposure table |
| 6 | plate |
| 7 | lift unit with suction cups |
| 8 | cylinder |
| 9 | path (for 5) |
| 10 | machine base |
| 11 | carriage (for 3) |
| 12 | path (for 11) |
| 13 | laser gun |
| 14 | path (for 13) |
| 15 | beams (13) |
| 16 | exposed part |
| 17 | edge (of 6) |
| 18 | additional pages |
| 19 | carriage means |
| 20 | bar |
| 21 | cylinder |
| 22 | laser carrier |
| 23 | path |
| 24 | bar |
| 25 | wagon (for 13) |
| 26 | carrier foot |
| 27 | sealing element |
| 28 | Venetian blid |

## Claims

1. Method of exposing multi-pages original images or several separate text and/or picture portions onto a light sensitive material like an offset plate or an intaglio plate by means of light exposure, wherein a light sensitive plate (6) is placed on a stepwise movable exposure table (5), the exposure table (5) with the plate (6) is moved to a predetermined position under a laser unit (3), the laser unit (3) is lowered to locking engagement with plate (6) on the exposure table (5), the plate is exposed by means of laser light beams, the laser unit (3) is raised from the plate (6), and the plate (6) is discharged for development and any other further handling.

2. Method according to claim 1, **characterized** in that the entire exposure operation is made fully automatized by collecting a light sensitive plate (6) from a plate cassette (1), putting said plate (6) on the stepwise movable exposure table (5), introducing the exposure table (5) with the plate (6) under the laser unit (3), lowering of the laser unit (3) into locking engagement with the plate (6), exposing the plate in several successive stages, and discharging the exposed plate (6) for subsequent developing etc. at the same time as a new, unexposed plate (6) is collected from the plate cassette (1).

3. Method according to claim 2, **characterized** in that the light sensitive plate (6) is exposed in several stages with a minor portion of the light sensitive plate at the time, for instance with two or four pages at the time out of a plate comprising 16, 32 or 64 pages, whereby the exposure is made by executing four cooperating movements of the parts of an exposure plant, namely a) a stepwise displacement of the exposure table (5) in a first direction (X-direction), b) a stepwise displacement of the laser unit (3) in a second direction (Y-direction) which is perpendicular to said first direction, c) a lowering of the laser unit (3) into locking engagement with the light sensitive plate (6), and d) a successive displacement in the Y-direction or in the X-direction of a laser gun (13) whereby said laser gun (13) is sweep exposing the light sensitive plate while the exposure table (5) and the laser unit (3) are in fixed positions, whereupon the laser unit (3) is raised, and the laser unit (3) and/or the exposure table (5) are/is moved to a new position for exposing of a new part of the plate (6).

4. Apparatus for executing the method according to any of claims 1-3 for exposing of multi-pages original images or several separate text and/or picuture portions on a light sensitive material like an offset plate or an intaglio plate (6) by light exposure by means of a copying machine comprising a cassette (1) for a light sensitive material, e.g. light sensitive films or plates (6), a laser unit (3) for light exposing said light sensitive material (6), a discharge conveyor (4) for the ready exposed light sensitive material, and an exposure table (5) having means for holding the light sensitive material (6) in a predeterined position thereon and arranged movable between the plate cassette (1) and the discharge conveyor (4) and under the laser unit (3), **characterized** in that the laser unit (3) is formed capable of taking two different positions, namely a raised position, in

which the exposure table (5) with the plate (6) can be moved freely under the laser unit (3), and a lowered position, in which the laser unit (3) is being pressed into locking engagement with the plate (6) on the exposure table (5) for making a displacement impossible of the plate (6) and the laser unit (3) in relation to each other.

**5.** Apparatus according to claim 4, **characterized** in that the laser unit (3) is displacably mounted on a laser base (10b) which is fixedly connected to the base (10a) of the entire copying machine, and in that the laser unit (3) comprises a laser carrier (11) which can be raised and lowered and which is movable on the laser base (10b), and a laser gun wagon (25), which is, in turn, displacable on the up and down movable laser carrier (11), so that the laser gun wagen (25), at still standing laser carrier (11), can be moved continuously while sweep exposing a light sensitive plate (6).

**6.** Apparatus according to claim 5, **characterized** in that the laser gun wagon (25) can be moved on the laser carrier (11) in the same direction as said laser carrier (11) can be moved on the laser base (10b), or perpendicularly therto, or in any direction differing from the moving direction of the laser carrier (11).

**7.** Apparatus according to any of claims 4, 5 or 6, **characterized** in that the laser carrier (11) is made of two parts, namely a lower laser carrier carriage means (19) which is movable on a path of the laser base (10b) and an upper laser carrier part (22) which is secured against any horizontal displacement in relation to the laser carriage means (19) but which can be raised and lowered in relation to said laser carriage means (19) by means of raising and lowering means (21).

**8.** Apparatus according to claim 7, **characterized** in that the upper laser carrier part (22) is formed as a light sealed box having a foot (26) which projects downwards between the laser bases (10b) and which can be brought into sealing and locking engagement with a light sensitive plate (6) presented on the exposure table (5).

**9.** Apparatus according to claim 8, **characterized** in that the laser gun (13) is light-sealingly connected to the upper surface of the laser carrier, so that the laser light beams sweep through the light sealed foot, and in that the laser gun (13) is displacable in relation to the laser carrier (22) under light sealed condition provided by Venetian blinds (28) or similar light sealing menas.

**10.** Apparatus according to any of claims 4-7, **characterized** in that the apparatus comprises a plate cassette (1) containing a large number of plates (6) and a plate loading lift (2) arranged for collecting a plate (6) when the exposure table (5) is in its depositing position at the discharge conveyor (4), and in that the various movable parts of the apparatus are super-guided by a computer which is programmed so that the displacement of the exposure table (5), the stepwise exposing of the plate (6) and the discharging of the exposed plate is made fully automatized in an successively proceeding stage, and whereby the collecting of a light sensitive plate (6) is made concurrently with the depositing of a ready exposed plate on the discharge conveyor (4).

**Patentansprüche**

**1.** Verfahren zum Belichten lichtempfindlichen Materials, wie beispielsweise einer Offsetdruckplatte oder einer Tiefdruckplatte, mit mehrseitigen Originalbildern oder mehreren separaten Text- und/oder Bildteilen mittels Licht, wobei eine lichtempfindliche Platte (6) auf einem schrittweise verfahrbaren Belichtungstisch (5) plaziert, der Belichtungstisch (5) mit der Druckplatte (6) in eine vorbestimmte Position unter einer Lasereinheit (3) gefahren, die Lasereinheit (3) in verriegelnden Kontakt mit der Druckplatte (6) auf dem Belichtungstisch (5) abgesenkt, die Druckplatte mittels Laserlichtstrahlen belichtet, die Lasereinheit (3) von der Druckplatte (6) angehoben und die Platte (6) zur Entwicklung oder sonstigen Weiterverarbeitung entladen wird.

**2.** Verfahren nach Anspruch 1, **dadurch gekennzeichnet**, daß der gesamte Belichtungsvorgang vollautomatisch durchgeführt wird, indem eine lichtempindliche Druckplatte (6) von einer Druckplattenkassette (1) aufgenommen, die Druckplatte (6) auf dem schrittweise verfahrbaren Belichtungstisch (5) abgelegt, der Belichtungstisch (5) mit der Druckplatte (6) unter die Lasereinheit (3) geführt, die Lasereinheit (3) in verriegelnden Kontakt mit der Druckplatte (6) abgesenkt, die Druckplatte in mehreren sukzessiven Schritten belichtet und die belichtete Druckplatte (6) zum anschließenden Entwickeln u.dgl. entladen wird, während gleichzeitig eine neue unbelichtete Druckplatte (6) der Druckplattenkassette (1) entnommen wird.

3. Verfahren nach Anspruch 2, **dadurch gekennzeichnet**, daß die lichtempfindliche Platte (6) in mehreren Schritten belichtet wird, wobei jeweils nur ein kleiner Teil der lichtempfindlichen Platte gleichzeitig belichtet wird, beispielsweise zwei oder vier Seiten gleichzeitig von einer Platte mit 16, 32 oder 64 Seiten, wobei die Belichtung durch Ausführung von vier zusammenwirkenden Bewegungen der Teile einer Belichtungsvorrichtung erfolgt, nämlich a) einem schrittweisen Verschieben des Belichtungstisches (5) in einer ersten Richtung (X-Richtung), b) einem schrittweisen Verschieben der Lasereinheit (3) in einer zweiten Richtung (Y-Richtung), welche senkrecht zu der ersten Richtung ist, c) einem Absenken der Lasereinheit (3) in verriegelnden Kontakt mit der lichtempfindlichen Platte (6) und d) einem sukzessiven Verfahren der Laserkanone (13) in Y-Richtung oder X-Richtung, wobei die Laserkanone (13) hin- und hergehend die lichtempfindliche Druckplatte belichtet, während der Belichtungstisch (5) und die Lasereinheit (3) in ihrer Position festgelegt sind, worauf die Lasereinheit (3) angehoben wird und die Lasereinheit (3) und/oder der Belichtungstisch (5) in eine neue Position zum Belichten eines weiteren Teiles der Druckplatte (6) bewegt wird bzw. werden.

4. Vorrichtung zum Ausführen des Verfahrens gemäß einem der Ansprüche 1 bis 3 zum Belichten lichtempfindlichen Materials, wie beispielsweise einer Offsetdruckplatte oder einer Tiefdruckplatte (6), mit mehrseitigen Originalbildern oder mehreren separaten Text- und/oder Bildteilen mittels einer Kopiermaschine, wobei die Vorrichtung aufweist eine Kassette (1) für lichtempfindliches Material, beispielsweise lichtempfindliche Filme oder Platten (6), eine Lasereinheit (3) zum Belichten des lichtempfindlichen Materials (6), einen Entladeförderer (4) für das fertig belichtete lichtempfindliche Material und einen Belichtungstisch (5), welcher Mittel zum Halten des lichtempfindlichen Materials in einer vorgegebenen Position besitzt und zwischen der Druckplattenkassette (1) und dem Entladeförderer (4) sowie unter die Lasereinheit (3) bewegbar ausgebildet ist, **dadurch gekennzeichnet**, daß die Lasereinheit (3) derart ausgebildet ist, daß sie zwei verschiedene Positionen einnehmen kann, nämlich eine angehobene Position, in welcher der Belichtungstisch (5) mit der Druckplatte (6) frei unter der Lasereinheit (3) bewegt werden kann, und eine abgesenkte Position, in welcher die Lasereinheit (3) in verriegelnde Auflage mit der Druckplatte (6) auf dem Belichtungstisch (5) gedrückt wird, um so eine Relativbewegung zwischen Druckplatte (6) und Lasereinheit (3) unmöglich zu machen.

5. Vorrichtung nach Anspruch 4, **dadurch gekennzeichnet**, daß die Lasereinheit (3) verschieblich auf einem Laserunterteil (10b) gelagert ist, welches fest mit dem Unterteil (10a) der gesamten Kopiermaschine verbunden ist und daß die Lasereinheit (3) einen Laserträger (11), welcher angehoben und abgesenkt werden kann und welcher auf dem Laserunterteil (10b) beweglich ist, und einen Laserkanonenwagen (25) aufweist, welcher seinerseits derart beweglich auf dem aufund abwärts bewegbaren Laserträger (11) ist, daß der Laserkanonenwagen (25) bei stehendem Laserträger (11) kontinuierlich während des hin- und hergehenden Belichtens einer lichtempfindlichen Platte (6) bewegt werden kann.

6. Vorrichtung nach Anspruch 5, **dadurch gekennzeichnet**, daß der Laserkanonenwagen (25) auf dem Laserträger (11) in die gleiche Richtung bewegt werden kann, in der auch der Laserträger (11) auf dem Laserunterteil (10b) bewegt werden kann, oder aber senkrecht dazu oder in jede beliebige von der Bewegungsrichtung des Laserträgers (11) abweichende Richtung.

7. Vorrichtung nach einem der Ansprüche 4, 5 oder 6, **dadurch gekennzeichnet**, daß der Laserträger (11) aus zwei Baugruppen besteht, nämlich einem unteren Laserträgerfahrgestellmittel (19), welches entlang einer Bahn auf dem Laserunterteil (10b) bewegbar ist, und einem oberen Laserträgerteil (22), welches gegen horizontale Verschiebungen relativ zu dem Laserfahrgestellmittel (19) gesichert ist, welches aber mittels Hub- und Absenkmitteln (21) relativ zu dem Laserfahrgestellmittel angehoben und abgesenkt werden kann.

8. Vorrichtung nach Anspruch 7, **dadurch gekennzeichnet**, daß der obere Laserträgerteil (22) als lichtdichtes Gehäuse mit einem Fuß (26) ausgebildet ist, welcher nach unten zwischen das Laserunterteil (10b) abkragt und welcher in hermetisch abdichtende und verriegelnde Auflage mit einer lichtempfindlichen Platte, welche auf dem Belichtungstisch (5) aufliegt, gebracht werden kann.

9. Vorrichtung nach Anspruch 8, **dadurch gekennzeichnet**, daß die Laserkanone (13) lichtdicht mit der oberen Oberfläche des Laserträgers derart verbunden ist, daß die Laserlicht-

strahlen hin- und hergehend durch den lichtabgeschotteten Fuß geführt werden, und daß die Laserkanone (13) relativ zu dem Laserträger (22) unter mittels einer Jalousie (28) o.ä. lichtabschottender Mittel hergestellten lichtabgeschotteten Bedingungen verschieblich ist.

**10.** Vorrichtung nach einem der Ansprüche 4-7, **dadurch gekennzeichnet**, daß die Vorrichtung eine Druckplattenkassette (1), welche eine große Anzahl von Druckplatten (6) enthält, und einen Druckplattenladelift (2) aufweist, welcher zum Aufnehmen einer Druckplatte (6) - wenn sich der Belichtungstisch (5) in seiner Auswerfposition bei dem Entladeförderer (4) befindet - ausgebildet ist, und daß die verschiedenen beweglichen Teile der Vorrichtung von einem Computer überwacht werden, welcher so programmiert ist, daß die Verschiebung des Belichtungstisches (5), das schrittweise Belichten der Druckplatte (6) und das Entladen der belichteten Druckplatte automatisch in einer sukzessiven Verfahrensschrittfolge durchgeführt werden, wobei das Aufnehmen einer lichtempfindlichen Platte (6) gleichzeitig mit dem Ablegen einer fertig belichteten Druckplatte auf dem Entladeförderer (4) durchgeführt wird.

## Revendications

**1.** Procédé pour exposer des images originales à pages multiples ou plusieurs parties séparées d'un texte et/ou d'une image sur un matériau photosensible tel qu'une plaque offset ou une plaque d'héliogravure au moyen de l'exposition à une lumière,
selon lequel on place une plaque photosensible (6) sur une table d'exposition (5) déplaçable pas-à-pas, on déplace la table d'exposition (5) équipée de la plaque (6) jusque dans une position prédéterminée au-dessous d'une unité laser (3), on abaisse l'unité laser (3) de manière qu'elle vienne en contact, avec blocage, contre la plaque (6) sur la table d'exposition (5), on expose la plaque à l'aide de faisceaux de lumière laser, on soulève l'unité laser (3) à partir de la plaque (6), et on évacue la plaque (6) pour son développement et tout autre traitement ultérieur.

**2.** Procédé selon la revendication 1, caractérisé en ce que l'ensemble de l'opération d'exposition est entièrement automatisée moyennant le prélèvement d'une plaque photosensible (6) à partir d'une cassette à plaques (1), la mise en place de ladite plaque (6) sur la table d'exposition (5) déplaçable pas-à-pas, l'introduction de la table d'exposition (5) équipée de la plaque (6) au-dessous de l'unité laser (3), l'abaissement de l'unité laser (3) pour sa mise en contact, avec blocage, contre la plaque (6), l'exposition de la plaque en plusieurs étapes successives, et l'évacuation de la plaque (6) en vue de son développement ultérieur, etc. en même temps qu'une nouvelle plaque non exposée (6) est prélevée de la cassette à plaques (1).

**3.** Procédé selon la revendication 2, caractérisé en ce que la plaque photosensible (6) est exposée en plusieurs étapes chaque fois avec une faible partie de la plaque photosensible, par exemple simultanément avec deux ou quatre pages faisant partie d'une plaque comprenant 16, 32 ou 64 pages, l'exposition étant réalisée moyennant l'exécution de quatre déplacements de coopération des parties d'une installation d'exposition, à savoir a) un déplacement pas-à-pas de la table d'exposition (5) dans une première direction (direction X), b) un déplacement pas-à-pas de l'unité laser (3) dans une seconde direction (direction Y), qui est perpendiculaire à ladite première direction, c) un abaissement de l'unité laser (3) pour l'amener en contact, avec blocage, contre la plaque photosensible (6), et d) un déplacement ultérieur dans la direction Y ou dans la direction X d'un canon laser (13), ledit canon laser (13) réalisant une exposition, avec balayage de la plaque photosensible, alors que la table d'exposition (5) et l'unité laser (3) sont dans des positions fixes, à la suite de quoi l'unité laser (3) est soulevée et l'unité laser (3) et/ou la table d'exposition (5) est/sont déplacée(s) jusqu'à une nouvelle position pour l'exposition d'une nouvelle partie de la plaque (6).

**4.** Procédé selon l'une quelconque des revendications 1-3 pour exposer des images originales à pages multiples ou plusieurs parties séparées d'un texte et/ou d'une image sur un matériau photosensible tel qu'une plaque offset ou une plaque d'héliogravure (6) moyennant l'exposition à la lumière au moyen d'une machine de copiage comprenant une cassette (1) pour un matériau photosensible, par exemple des films photosensibles ou des plaques photosensibles (6), une unité laser (3) pour exposer à la lumière ledit matériau photosensible (6), un convoyeur d'évacuation (4) pour le matériau photosensible exposé près, une table d'exposition (5) comportant des moyens pour retenir le matériau photosensible (6) dans une position prédéterminée sur cette table et agencée de manière à être déplaçable entre la cassette à plaques (1) et le convoyeur d'éva-

cuation (4) et au-dessous de l'unité laser (3), caractérisé en ce que l'unité laser (3) est agencée de manière à pouvoir prendre deux positions différentes, à savoir deux positions soulevées, dans laquelle la table d'exposition (5) pourvue de la plaque (6) peut être déplacée librement au-dessous de l'unité laser (3), une position abaissée, dans laquelle l'unité laser (3) est repoussée de manière à être en contact, avec blocage, contre la plaque (6) sur la table d'exposition (5) pour rendre impossible un déplacement réciproque de la plaque (6) et de l'unité laser (3).

**5.** Procédé selon la revendication 4, caractérisé en ce que l'unité laser (3) est montée, de manière à être déplaçable, sur une base (10b) du laser, qui est raccordée de façon fixe à la base (10a) de l'ensemble de la machine de copiage, et en ce que l'unité laser (3) comprend un support (11) pour le laser, qui peut être soulevé et abaissé et qui est déplaçable sur la base (10b) du laser, et un chariot (25) de support du canon laser, qui à son tour est déplaçable sur le support (11) du laser, qui peut être soulevé et abaissé, de sorte que le chariot (25) de support du canon laser peut être déplacé continûment, alors que le support (11) du laser est arrêté, tout en réalisant l'exposition par balayage d'une plaque photosensible (6).

**6.** Procédé selon la revendication 5, caractérisé en ce que le chariot (25) du support du canon laser peut être déplacé sur le support (11) du laser dans la même direction que celle dans laquelle ledit support (11) du laser peut être déplacé sur la base (10b) du laser ou perpendiculairement à cette dernière, ou dans n'importe quelle direction qui diffère de la direction de déplacement du support (11) du laser.

**7.** Procédé selon l'une quelconque des revendications 4, 5 ou 6, caractérisé en ce que le support (11) du laser est constitué de deux parties, à savoir des moyens inférieurs formant chariot (19) du support du laser, qui sont déplaçables sur une trajectoire de déplacement de la base (10b) du laser, une partie supérieure (22b) du support du laser, qui est bloquée contre tout déplacement horizontal par rapport aux moyens formant chariot (19) du laser, mais qui peut être soulevée et abaissée par rapport auxdits moyens formant chariot (19) du laser, à l'aide de moyens de soulèvement et d'abaissement (21).

**8.** Procédé selon la revendication 7, caractérisé en ce que la partie supérieure (22) du support du laser est réalisée sous la forme d'une boîte étanche à la lumière possédant un pied (26) qui fait saillie vers le bas entre les bases (10b) du laser et qui peut être placée en contact, d'une manière étanche et avec blocage, contre une plaque photosensible (6) présentée sur la table d'exposition (5).

**9.** Procédé selon la revendication 8, caractérisé en ce que le canon laser (13) est connecté, d'une manière étanche à la lumière, à la surface supérieure du support du laser, de sorte que les faisceaux de lumière laser exécutent un balayage à travers le pied étanche à la lumière et en ce que le canon laser (13) est déplaçable par rapport au support (22) du laser, dans des conditions d'étanchéité à la lumière fournies par des jalousies (28) ou des moyens similaires d'étanchéité à la lumière.

**10.** Procédé selon l'une quelconque des revendications 4-7, caractérisé en ce que le dispositif comporte une cassette à plaques (1) contenant un nombre important de plaques (6) et un dispositif élévateur (2) pour le chargement d'une plaque, agencé pour prélever une plaque (6), lorsque la table d'exposition (5) est dans sa position de dépôt sur le convoyeur d'évacuation (4), et en ce que les différentes parties mobiles du dispositif sont super-guidées par un ordinateur, qui est programmé de telle sorte que le déplacement de la table d'exposition (5), l'exposition pas-à-pas de la plaque (6) et l'évacuation de la plaque exposée sont effectués d'une manière entièrement automatisée lors d'un stade ultérieur de traitement, le prélèvement d'une plaque photosensible (6) étant de ce fait réalisé en même temps que s'effectue le dépôt d'une plaque exposée à l'état prêt, sur le convoyeur d'évacuation (4).

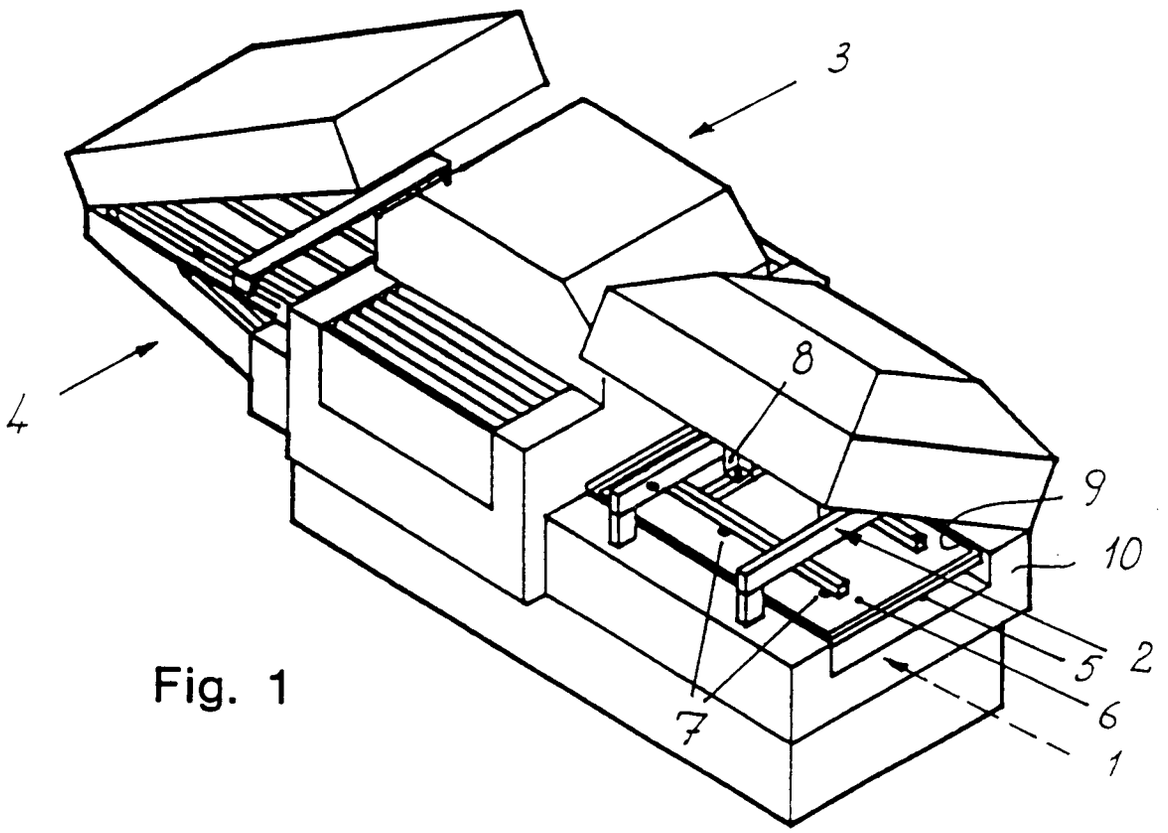


Fig. 1

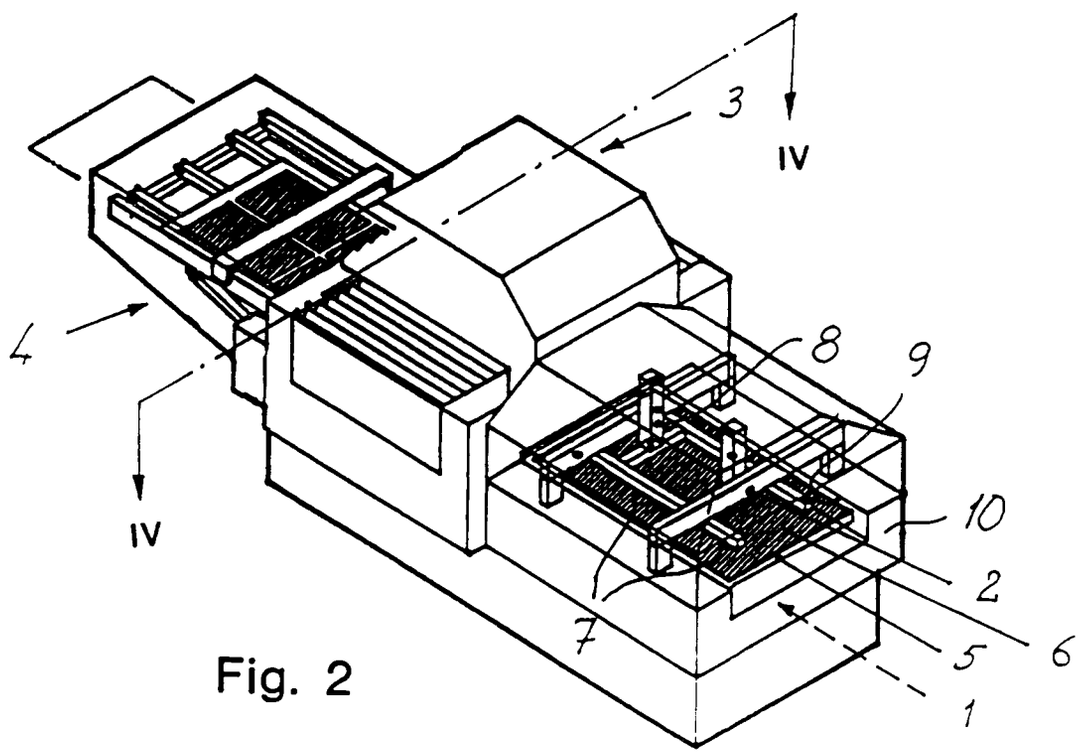


Fig. 2

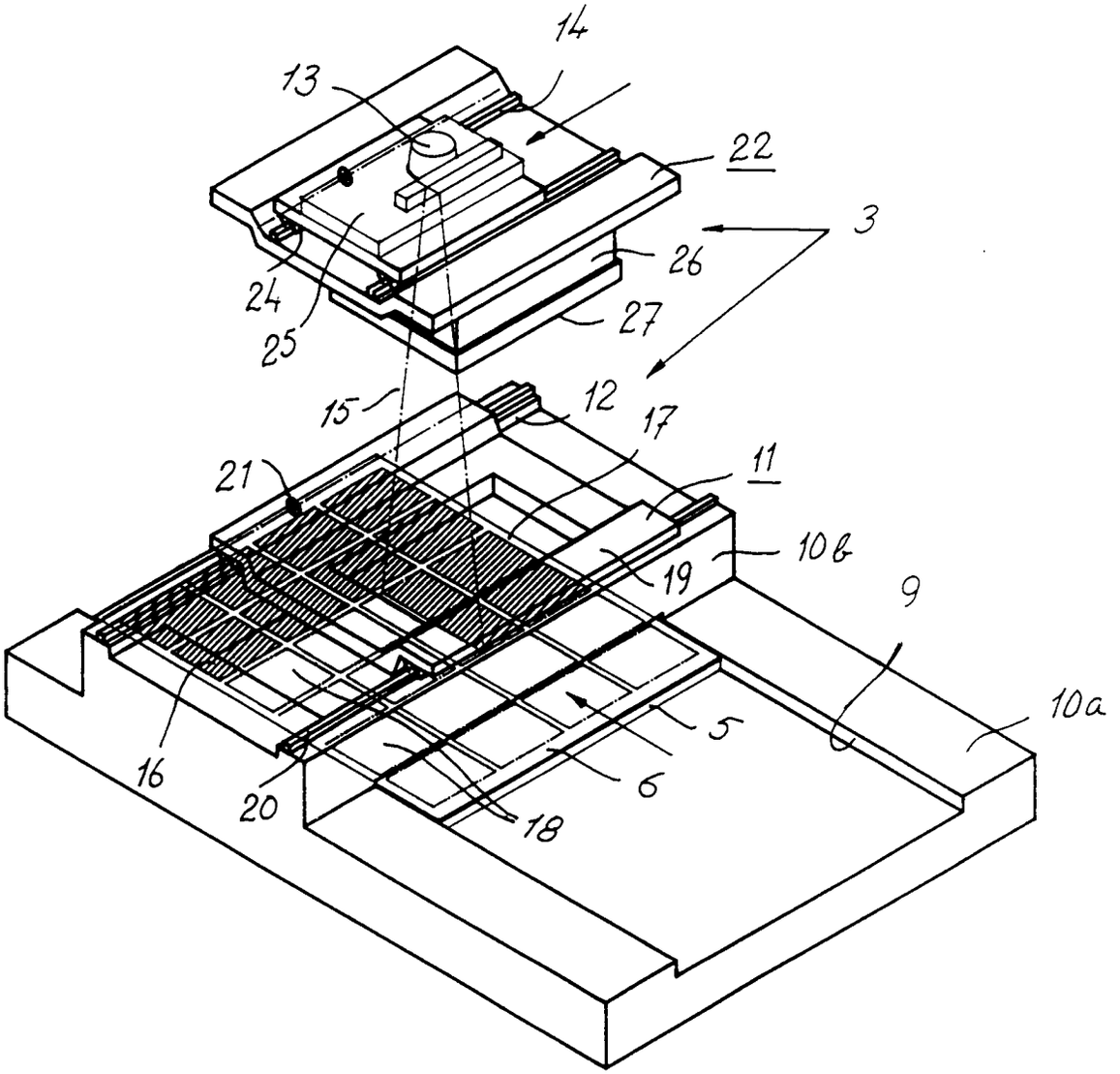


Fig. 3

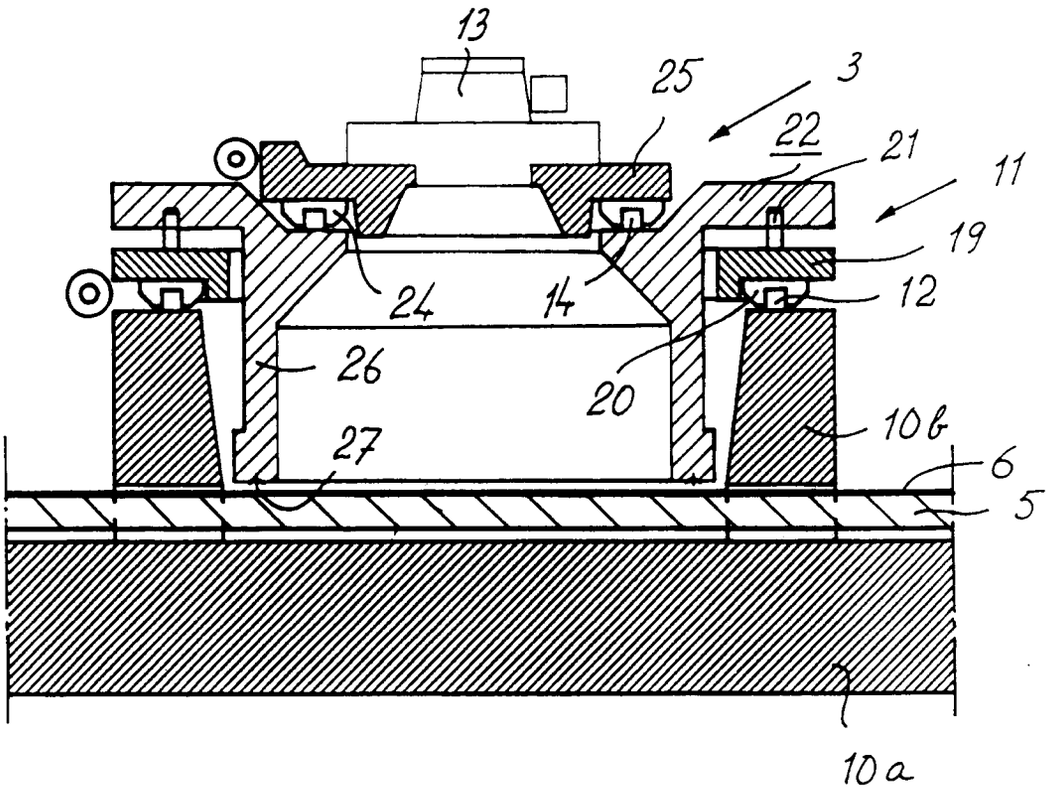
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Fig. 4

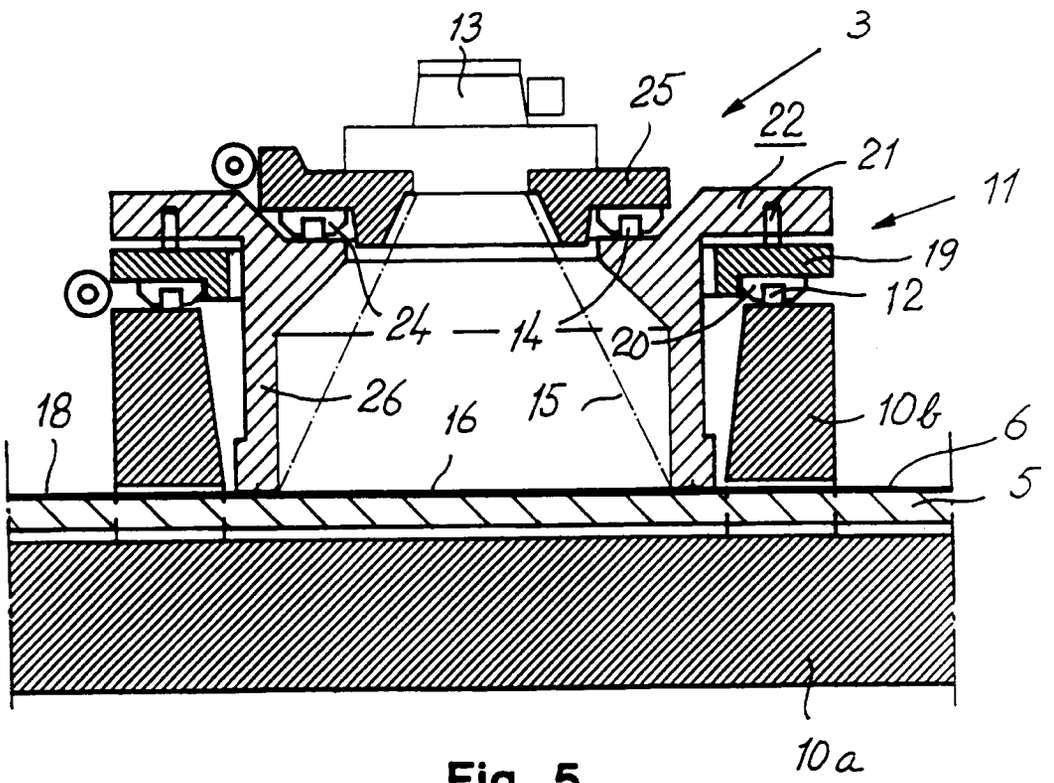
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Fig. 5